

GCSE Mathematics

H

Algebraic Proof

Higher | Grades 6-9

Total Marks	Time	Questions
62	62 min	20

Instructions:

- Do not use a calculator when you see: 
- Answer all questions in the spaces provided.
- Show all your working - marks are awarded for method as well as final answers.
- Cross through any work you do not want to be marked.
- Check your answers if you have time at the end.

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Edexcel-style questions**Q1** 

Grade 6

Edexcel style

Prove that the sum of two consecutive integers is always odd.

Answer

teachably

[3 marks]**Q2** 

Grade 7

Edexcel style

Prove that the sum of three consecutive integers is always a multiple of 3.

Answer

teachably

[3 marks]**Q3** 

Grade 8

Edexcel style

Prove that $(n + 1)^2 - n^2 = 2n + 1$ for any integer n .

Answer

teachably

[3 marks]

Q4

Grade 8

Edexcel style

A two-digit number has tens digit a and units digit b , so the number is $10a + b$. Prove that the sum of a two-digit number and the number formed by reversing its digits is always a multiple of 11.

Answer

teachably

[3 marks]**Q5**

Grade 9

Edexcel style

A student claims that $n^2 + n + 1$ is a prime number for every positive integer value of n . Show that the student is wrong.

Answer

teachably

[3 marks]

AQA-style questions**Q6** 

Grade 6

AQA style

Prove that the sum of three consecutive even numbers is always a multiple of 6.

Answer

teachably

[3 marks]**Q7** 

Grade 7

AQA style

Prove that $n^2 + n$ is always even for any positive integer n .

Answer

teachably

[3 marks]**Q8** 

Grade 8

AQA style

Prove that the difference between the squares of two consecutive odd numbers is always a multiple of 8.

Answer

teachably

[4 marks]

Q9

Grade 8

AQA style

A two-digit number has tens digit a and units digit b , with $a > b$, so the number is $10a + b$. Prove that the difference between the number and the number formed by reversing its digits is always a multiple of 9.

Answer

teachably

[3 marks]**Q10**

Grade 9

AQA style

Prove that the sum of the squares of any two consecutive integers is always odd.

Answer

teachably

[3 marks]

OCR-style questions**Q11** 

Grade 6

OCR style

Prove that the product of two odd numbers is always odd.

Answer

teachably

[3 marks]**Q12** 

Grade 7

OCR style

Prove that $6n + 9$ is always a multiple of 3, for any integer n .

Answer

teachably

[2 marks]**Q13** 

Grade 8

OCR style

Prove that $(2n + 1)^2 - (2n - 1)^2 = 8n$ for any integer n .

Answer

teachably

[3 marks]

Q14

Grade 8

OCR style

A three-digit number has all three digits equal to d (for example 222 or 555), so the number is $100d + 10d + d$. Prove that this number is always a multiple of 3.

Answer _____

teachably

[3 marks]**Q15**

Grade 9

OCR style

Prove algebraically that the difference between the squares of any two consecutive multiples of 3 is always a multiple of 9.

Answer _____

teachably

[4 marks]

Teachably-style questions**Q16** 

Grade 6

Teachably style

Prove that the sum of an odd number and an even number is always odd.

Answer

teachably

[3 marks]**Q17** 

Grade 7

Teachably style

Prove that the sum of any two multiples of 5 is also a multiple of 5.

Answer

teachably

[3 marks]**Q18** 

Grade 8

Teachably style

Prove that $n^2 - (n - 2)^2 = 4n - 4$ for any integer n .

Answer

teachably

[3 marks]

Q19

Grade 8

Teachably style

A four-digit number has the digit pattern abab (for example 2323 or 5757), so the number is $1000a + 100b + 10a + b$. Prove that this number is always a multiple of 101.

Answer _____

teachably

[3 marks]

Q20

Grade 9

Teachably style

Prove that $n^3 - n$ is always a multiple of 6, for any integer n .

Answer _____

teachably

[4 marks]

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